SAND2010-6422P

Storage and Transportation Safety and Security Assessments

Presentation to:

The Blue Ribbon Commission on America's Nuclear Future
Sub-committee on Transportation and Storage

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September 23, 2010
Washington DC

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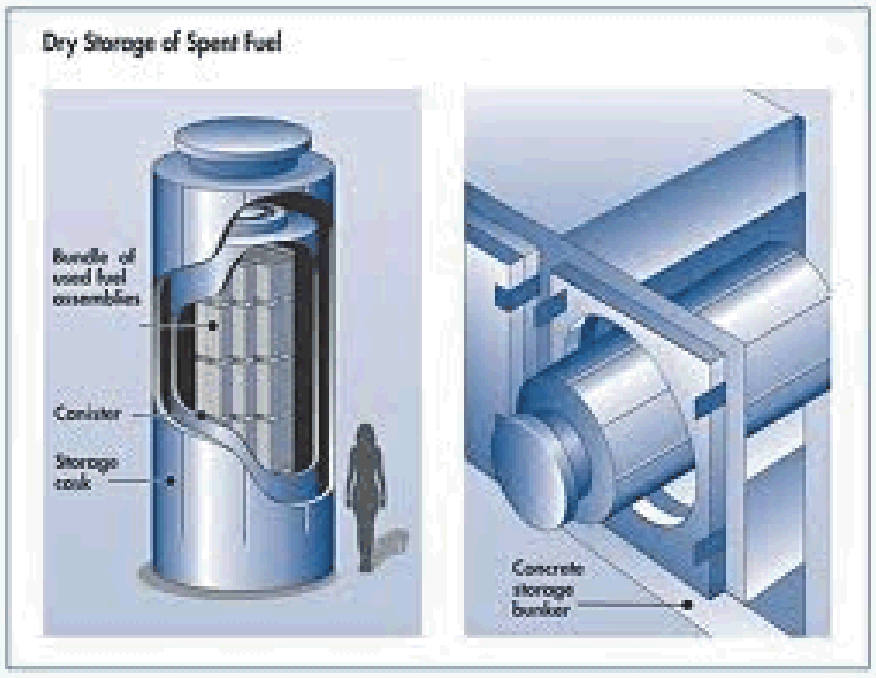


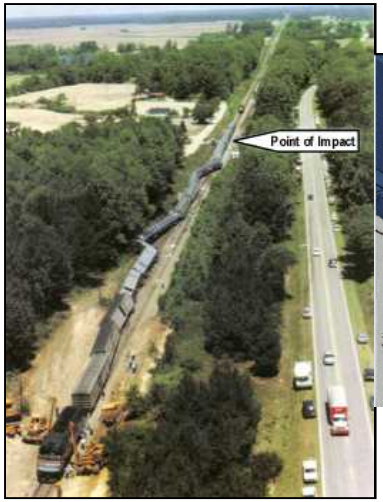
History

- Since the ’70s, substantial analytical and experimental work has been conducted to assess the adequacy of storage and transportation regulations to protect the public and environment from harmful consequences that could result from a radioactive material release stemming from an accident or terrorist event.

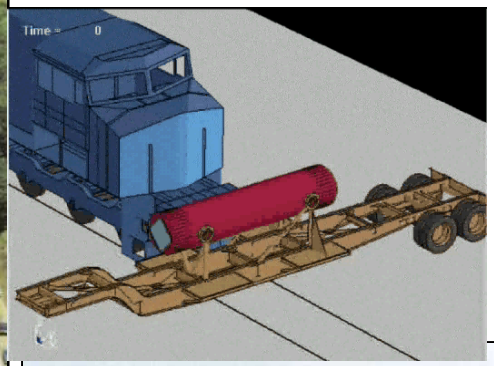
- This work can be categorized in two broad areas:
  - Safety
  - Security

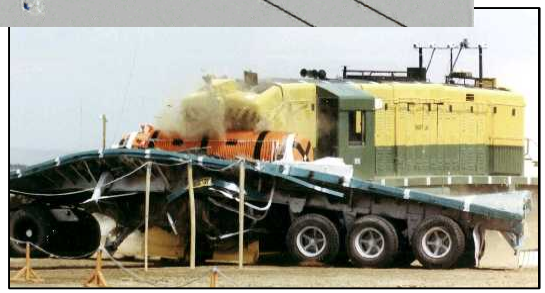
History – Safety Assessments

- Three NRC publications demonstrate the progress that has been made in transportation safety risk assessments over the last 30 years.
  - NUREG-0170 (1977): original transportation EIS for transportation of radioactive materials
  - NUREG/CR-4829: aka; The Modal Study (1987)
  - NUREG/CR-6672: "Re-examination of Spent Fuel Shipment Risk Assessments" (2000)
- These assessments have been refined with the evolution of advanced computer modeling and analysis, more detailed Federal accident databases, more sophisticated routing models, and expanded experimental databases.
- Much of this work focuses on severe mechanical and thermal loadings that may arise from severe accident conditions.



South Carolina 1995 Train/Tractor-Trailer impact





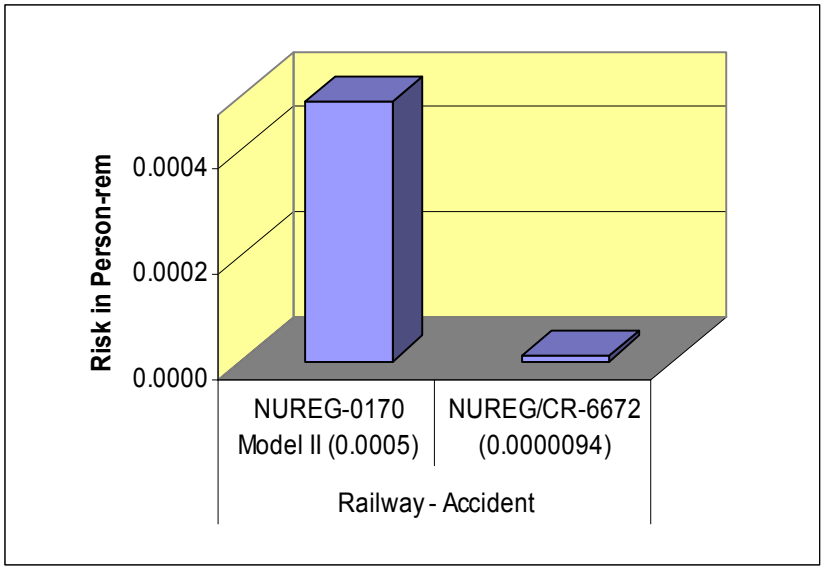
Baltimore 2001 Howard Street Tunnel Fire

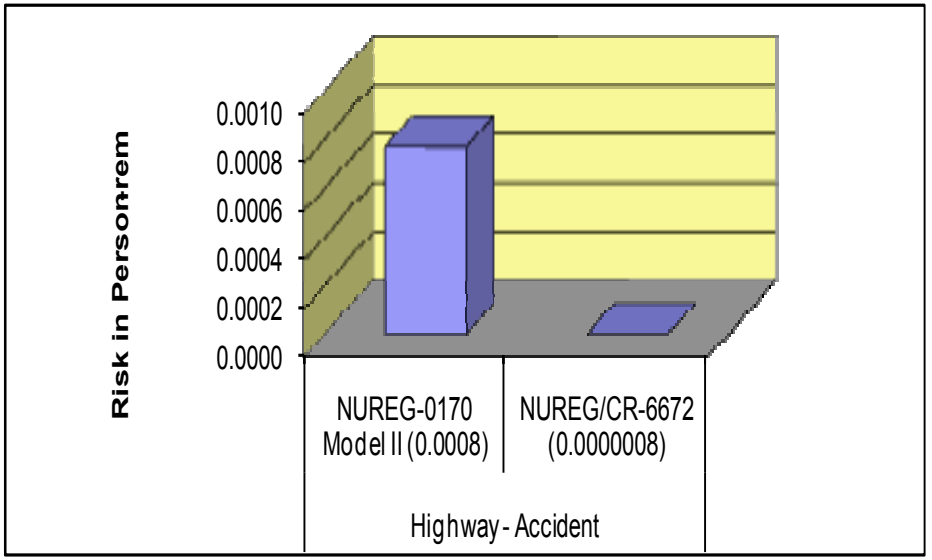
Calorimeter Test

Full-scale drop test of TRUPACT III

History – Safety Assessments

- From NUREG-0170 to NUREG/CR-6672, estimated transportation risks under accident conditions have been reduced significantly.
  - Rail: reduced 2 orders of magnitude
  - Truck: reduced 3 orders of magnitude





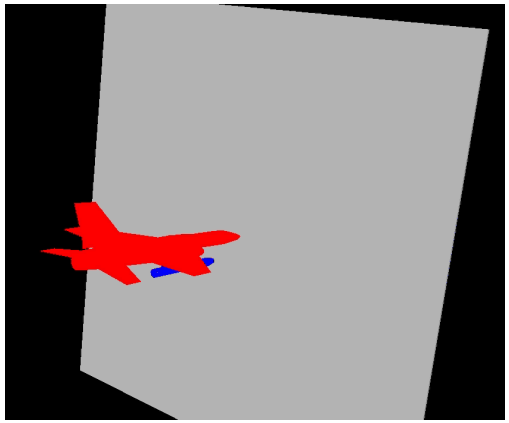
History – Security Assessments

- Security assessments published in the late ‘70s and early ‘80s estimated consequences from specific types of attacks on transportation casks.
- For example, NUREG/CR-0743 (1980), referred to as the Urban Study, estimated dose consequences from a terrorist attack on a truck cask in a densely populated urban environment.
- Wide variability of results in these early reports led to experimental testing to better understand release mechanisms and subsequent dispersal of radioactive materials. These experiments provided valuable data for further analytic studies as well as data for EIS development, such as the Yucca Mountain FEIS.
- After 9/11, the NRC conducted a comprehensive assessment of consequences stemming from different types of attacks on a wide range of fuel cycle assets and facilities.

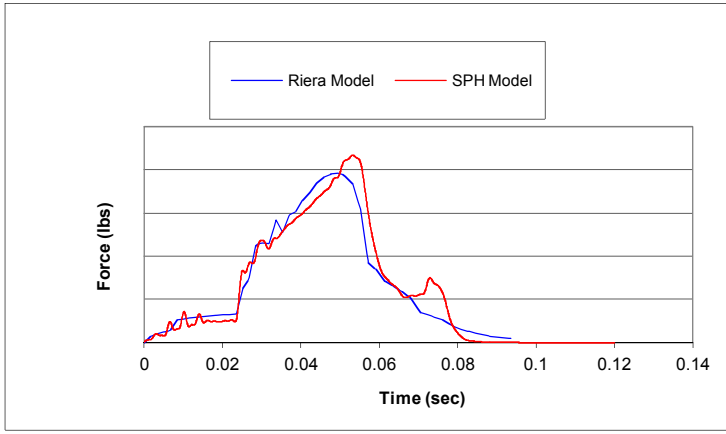
History – Security Assessments

- In aggregate, consequence assessments and tests have been conducted on of a wide range of types of attacks and different types of facilities and materials.
- This experience has expanded our understanding of how engineered components respond to a variety of severe loading conditions and how spent fuel disperses if it can be released.
- These analyses and data can then be used as a technical basis for assessing the physical protection of licensed facilities against specific types of threats.

F-4 Load Cell Test



Impact into an unyielding, flat surface



Force vs. time plot from analysis

Observations

The amount of work that has been done in the area of spent fuel storage and transportation safety and security assessment is substantial.

- Transportation of spent nuclear fuel is safe.
- The robust nature of spent fuel casks (storage and transport) acts to mitigate potential consequences from a terrorist attack.
- Lack of openness with security assessments can inhibit public acceptance of spent fuel transportation and storage.

There is also a substantial amount of work that has been done internationally in assessing safety and security of spent nuclear fuel transportation and storage.

Applying past experience to current and future operations

- Based on comprehensive assessments coupled with security up-grades as warranted, the NRC has a functional process to assess operational practices to ensure that the storage and transportation of spent fuel is safe, secure, and compliant with the regulations.

- Issues associated with consolidated storage, removal of spent fuel from orphaned sites, and security up-grades at existing sites are all worthy of careful consideration. However, they should be evaluated making full use of the studies already available and in a systems context that considers the full range of risks and benefits.